SPECIALIZED MOBILE RADIO

This document describes various aspects of Specialized Mobile Radio (SMR). It provides only a "snapshot" of SMR services today; recognizing that technology is evolving, and industry is introducing new services and capabilities at a rapid pace. This document is not intended to reflect a government position or endorse a particular service provider or service. Rather, it is provided to offer broad industry information on SMR. We invite comments to ensure that the most current information is included in our analyses.

If you have comments regarding the information contained in this document, please contact the Public Safety Wireless Network (PSWN) Program Management Office (PMO) at 800-565-PSWN or access the PSWN Program Home Page at: www.pswn.gov

Public safety agencies rely heavily on their land mobile radio (LMR) networks for communications and coordination within and among organizations. In the past few years, commercial services such as cellular and paging have provided powerful capabilities that complement existing public safety networks. It is important that public safety communities carefully evaluate, assess, and maintain current information on the expanding commercial wireless marketplace. This allows informed, objective assessments that will ultimately meet mission requirements.

Commercial service providers have developed a number of services to meet the needs of mobile customers. One of these services is specialized mobile radio (SMR). This report describes SMR services, discusses some of the key SMR performance characteristics, provides sample costs, lists some considerations in selecting SMR services, and provides a checklist to assist in determining whether SMR meets user needs.

What Is Specialized Mobile Radio?

SMR is a commercial wireless service that provides mobile dispatch and data communication services. Dispatch service allows users to communicate with a single radio or simultaneously with all radios, or with a subgroup of radios in a group.

Traditional SMR service is similar to private LMR because it offers primarily voice dispatch service within a local area. Recently, new SMR technologies have led to the development of advanced SMR systems that offer cellular, dispatch, and paging services in a single handset. These networks provide features comparable to those currently offered to cellular subscribers, such as messaging, caller identification, and voicemail. The advanced networks use digital technologies and cover large geographic areas. Important SMR considerations are summarized in Exhibit 1.

Availability	• Identifies whether SMR services can be acquired from a carrier in a given region
Coverage	• Identifies whether SMR calls can reach users in a given service area
Reliability	• Identifies whether SMR users can access and use services during congestion or network disruption
Transmission Speed	• Describes the end-to-end data speed
Security	• Describes the level of inherent security of the service and the capability to add security measures
Cost	• Characterizes the typical costs of SMR services

Exhibit 1
Key SMR Characteristics

Availability

There are approximately 8,000 SMR systems in the United States (1). Local and regional carriers operate most of these systems and cater to specific markets. Because SMR does not use a common standard or protocol, the systems operate using different technologies. SMR is also offered in three different frequency bands: 220, 800, and 900 megahertz. The various standards and frequency bands make it difficult for users to operate on networks other than their own. Therefore, users are limited in the areas where they can travel outside their home service area.

However, some service providers have joined to form regional or nationwide networks, either through acquisition or by entering into agreements with other carriers. In addition, the SMR industry is slowly adopting protocols that will allow networking capability and frequency transparency. Before obtaining SMR, users who require service in large geographic areas or in several different locations should make sure providers offer service in those areas.

Coverage

SMR coverage is limited compared with other commercial services because only about half of all SMR subscribers are interconnected to the public switched network (PSN) (2). Often, communications are used strictly for the internal needs of an organization and access to the PSN is not required. As a result, many small- to medium- sized regional operators offer dispatch services only. Users on these networks cannot place or receive phone calls to other users on the PSN.

Large operators offer an integrated service that combines dispatch and PSN interconnection. If a network connects to the PSN, users may require

integrated radios, which combine dispatch and cellular services into a single handset.

SMR users may also experience coverage gaps similar to those in cellular telephony. This problem may occur in remote areas or away from major roads where carriers have not yet built out service areas. Coverage gaps may also be caused by terrain or buildings that interfere with the signal. These gaps form "dead spots" within the region where the carrier's signal is non-existent or too weak to communicate. In these areas, SMR users cannot send or receive phone calls.

Reliability

SMR customers compete with other users for access to the network. If the system is fully loaded and all channels are in use, users either receive a busy signal or calls are "queued" until a channel is free. However, SMR is not typically used by the mass market, so it may be less susceptible to surge than other services, such as cellular or personal communication services. Some SMR systems offer a priority access capability. Users with responsibility for mission-critical tasks may choose to consider a provider that offers priority access.

Unlike LMR, SMR services do not allow radios to communicate directly with each other, a type of communication is also known as "talk around" service. SMR radios must first communicate through the base station. Therefore, if the SMR network is damaged, users will not be able to directly communicate.

Transmission Speed

Data transmission using SMR is available only on a limited basis. Modems can be attached to a mobile unit, and data is transmitted over the network. Data services include two-way messaging, paging, and facsimile. Although SMR is capable of transmitting data at up to 9.6 kilobits per second (kbps), the actual data speed, or throughput, is limited in most cases to 4.8 kbps.

Security

Different security risks and vulnerabilities are associated with all commercial wireless services. Analog SMR does not offer secure communications. Although digital technologies offer more privacy features than analog, they are still not considered secure. SMR currently does not have an encryption scheme imbedded in its network. However, encryption can be applied to some systems. Users with strict security requirements should find out when requesting service whether encryption can be supported.

SMR from a Network-Level Perspective

A traditional SMR system consists of one or more base stations, one or more antennas, and end user radio equipment. Either a mobile user or a dispatcher can originate a call. The call is routed from the radio or dispatcher to the base station. The base station transmits and receives signals to mobile units within its coverage area. Mobile users can be connected to the PSN through the SMR operator or through the

dispatch center. Exhibit 2 illustrates a traditional SMR network.

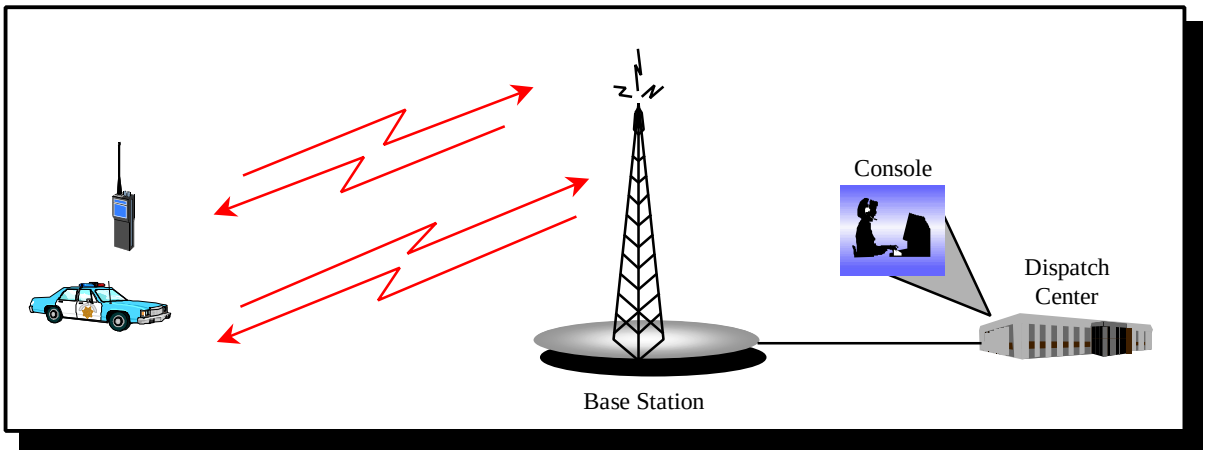

Exhibit 2
SMR from a Network Level

Cost

SMR customers pay equipment and service costs. Pricing structures vary by carrier and type of service. A typical SMR monthly rate plan for a large, digital service carrier with PSN connection is shown in Exhibit 3 (3). The average cost for dispatch only service ranges from $15.50 to $14.60 (4).

Cellular Service Only	Plan 1	Plan 2	Plan 3
Monthly Access	$39	$69	$99
Digital Cellular Minutes Included	60	150	300
Additional Minutes	$.30 / min	$.25 / min	$.23 / min
Numeric Pages	Unlimited	Unlimited	Unlimited
Text Messages	25	25	25
Long Distance	$.15 / min	$.15 / min	$.15 / min
Enhanced Voice Mail	$5.00	$5.00	$5.00
Enhanced Service Plan	**Plan 1**	**Plan 2**	**Plan 3**
Monthly Access	$69	$89	$109
Digital Cellular Minutes Included	60	150	300
Additional Minutes	$.30 / min	$.25 / min	$.23 / min
Talk Group Minutes Included	150	150	150
Additional Talk Group Minutes	$.10 / min	$.10 / min	$.10 / min
Numeric Pages	Unlimited	Unlimited	Unlimited
Text Messages	25	25	25
Long Distance	$.15 / min	$.15 / min	$.15 / min
Enhanced Voice Mail	$5.00	$5.00	$5.00

Exhibit 3
Representative Basic and Enhanced SMR Service Fees

In addition to service costs, subscribers usually have to buy end-user radio equipment. SMR radios vary in appearance and often resemble a cellular phone or sophisticated citizen band radio. The radios typically operate in a push-to-talk fashion, although dial-up is becoming more common. Prices can range from less than $200.00 to $1,000.00, depending on what features the equipment includes and whether it operates using analog or digital technology (5).

SMR Considerations

Users must think carefully about what commercial services may meet their operational requirements. Exhibit 4 lists some considerations in selecting SMR services. SMR service packages and billing structures are likely to vary among carriers. Before acquiring SMR service, potential users may choose to employ the checklist at Exhibit 5 to assist in determining whether CDPD meets their needs.

SMR Considerations

- **Direct Talk Group Capability**—SMR enables users to talk on an individual, talk group, or fleet basis.
- **Bundled Wireless Services**—Some SMR systems provide numeric paging, text messaging, PSN interconnection, mobile dispatch, and talk group functions.
- **Call Set Up—**SMR dispatch service takes about 1/ 10th of the time that cellular requires to set up a call (6).
- **High Radio Equipment Costs**—The cost of SMR end-user equipment is generally higher than most commercial wireless services because SMR providers have targeted primarily mobile business users.
- **Lack of PSN Interconnection—**Many SMR networks do not offer access to the PSN.
- **Coverage—**Because SMR lacks a standard protocol, users are restricted where they can roam outside of their home service areas. The majority of SMR service providers offer service in a limited area.

Exhibit 4
Benefits and Limitations of SMR

SMR CHECKLIST

- ☑ Do I need dispatch, voice, and data services?
- ☑ Where do I need these services? Locally? Regionally? Nationally?
- ☑ Will SMR service work in my operational environment?
- ☑ Will it support mission critical requirements?
- ☑ What is the coverage area of the SMR service, including extended calling areas provided through roaming agreements?
- ☑ Are there known dead spots?
- ☑ What is the full cost of the service package, including dispatch communications, PSN interconnection charges, long distance charges, and roaming fees?
- ☑ Are there government rates that may reduce overall charges?
- ☑ Do I need encryption? If so, does the system support encryption?
- ☑ Is there a priority access capability?
- ☑ Does the carrier offer data services? If so, what type and speeds?
- ☑ Does the carrier offer access to the PSN?

Exhibit 5
Considerations in Adopting SMR Services

APPENDIX A
REFERENCES

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4. American Mobile Telecommunications Association. *Specialized Wireless Communications: An Industry Overview* Washington DC, 1997.

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APPENDIX B
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